CREST Status Report - October 7, 1998

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Activity: Consolidated Reporting of EarthquakeS and Tsunamis (CREST)

1) ATWC integration: We successfully completed the installation of the CREST communications and computing system at the West Coast & Alaska Tsunami Warning Center (ATWC) in September, 1998. The installation consists of communication links, computers, Ethernets, and software. The objective is to reliably supply critical data from regional seismic networks in North America into the ATWC processing systems. The objective is being met through the upgrade and installation of modern seismic equipment at the regional seismic networks and installation of uniform software at the seismic and warning centers. Broad band sensor installation is ongoing (see item 2 below); narrow-band sensor data is being used meanwhile.

The communication links are as follows, and consist of individual, dedicated 56 Kbit full-duplex telephone lines:

USNSN (Seattle, WA) to USNSN (Golden, CO)
NCSN(Menlo Park, CA) to USNSN
USNSN to ATWC (Palmer, AK)
AEIC (Fairbanks, AK) to Palmer

These lines have been made into a private Internet by exploiting the abilities of routers to makes the entire CREST network appear like a TCP/IP subnet, much as one would find inside a building. The linkages established were:

Provider	Recipient	Internet	Dedicated 56 Kbit	Triggered Waveforms	Continuous Waveforms	Hypocenters
USNSN[1]	ATWC		X	X		
NCSN	ATWC		X		X	X
IDA[1,2]	ATWC	X	X		X	
PNSN	ATWC		X		X	X
PGC[3]	ATWC	X			X	
AEIC	ATWC		X		X	
ATWC[1]	AEIC		X		X	
ATWC	AVO	X			X	

[1] Waveforms transmitted in compressed format
[2] Data sent via Internet to USNSN, dedicated line to ATWC.
[3] PGC is not connected to dedicated line, but software is operational

The computers at the regional centers (CTS's, for Core Tsunami System) are dedicated machines with two network ports: one port collects data from the center's processing system, and the other deals exclusively with the dedicated lines. The computers dealing with these lines at ATWC are two identical Sun Microsystems Ultra's running Solaris.

The configuration is shown in Figure 1 (page 4 of the report). It consists of two independent systems, "Primary" and "Secondary." Both Primary and Secondary systems are running all the time. This avoids the danger of the spare not working when called upon.

Each of the two systems (Primary and Secondary) consists of a "loading dock" machine (the Ultra-Solaris), and a processing machine (Intel-NT). The "loading dock" machine is responsible for managing the various telemetry and communication channels and for presenting the data to its processing machine. The processing machine (a) acquires the local stations, (b) accepts the data from the Primary loading dock, and (c) performs the ATWC processing. The Primary "loading dock" machine has access to the dedicated lines and the Internet. The Secondary "loading dock" sees only the Internet. Thus, the Primary system uses all available data, while the Secondary system uses local data, and whatever might have arrived via the Internet. The sending computers at the various seismic centers are configured to send their data in two sets: a Primary data set which goes over the dedicated lines, and a Secondary set which is shipped via the Internet.

As this completes a major component of the CREST system, I want to take this opportunity to acknowledge the following people whose efforts made this possible. The number of people is indicative of the 2-year effort required to create this system.

	Location	**Agency**	**Role**
Alex Bittenbinder	Golden	USGS	CREST Technical Project Manager
Barbara Bogaert	Golden	USGS	CREST Project Scheduling and Coordinator
Richard Baldwin	Vancouver	GSC	PGC software developer
Ray Buland	Golden	USGS	USNSN Project Chief
David Chavez	San Diego	ESS	Private software consultant
Lynn Dietz	Menlo Park	USGS	NCSN software developer
Skip Dutrow	Reston	USGS	Telephone communications
Roger Hansen	Fairbanks, AK	Univ AK	Alaska State Seismologist
Danny Harvey	Boulder	BRTT	Private software developer
Carl Johnson	Hilo	Univ HI	Seismologist/software consultant
David Ketchum	Golden	USGS	USNSN software developer
Will Kohler	Menlo Park	USGS	NCSN software developer
David Kragness	Menlo Park		Private software consultant
Carl Lawson	Menlo Park	USGS	Internet/router communications
Kent Lindquist	Fairbanks	Univ AK	AEIC seismologist
Pete Lombard	Seattle	Univ WA	PNSN software developer
Jim Luetgert	Menlo Park	USGS	NCSN seismologist
Steve Malone	Seattle	Univ WA	PNSN seismologist
Patrick Murphy	Menlo Park	USGS	Internet/router communications
Garry Rogers	Vancouver	GSC	PGC seismologist
Tom Sokolowski	Palmer	NOAA	ATWC Director
Barb Stocker	Menlo Park	USGS	Internet/router communications
Paul Whitmore	Palmer	NOAA	ATWC seismologist

2) Field equipment: Equipment vendors were quite late in delivering equipment. Consequently, installations of seismic instrumentation have been delayed. Partial shipment of

data loggers for the NCSN, HVO, and AEIC were received in September, and dataloggers for ATWC are expected in October. Broad-band sensors and accelerometers were delivered by August. Tentative installation schedules are as follows:

AEIC:	4 sites in October
ATWC:	2 sites in October/November, pending delivery of dataloggers and resolution of software interface to CTS systems.
NCSN:	2 sites in November/December, pending delivery of software for datalogger interface to CTS systems
HVO:	2 sites after January, 1999
PNSN:	2 sites after January, 1999. Initial plan anticipated utilization of existing PNSN dataloggers, but subsequently we discovered that they would not meet specifications. New dataloggers are in procurement.
UO:	2 sites after January 1999. Same issue as PNSN.
UCB:	UCB and the NCSN have agreed to jointly operate a CREST site with communications being transmitted simultaneously to Menlo Park (via microwave) and UCB (via Framerelay). Although datalogger is twice expensive as other CREST dataloggers, UCB has agreed to transmit data from their new broadband site near Arcata (Jacoby Creek) into the CREST system. Thus, CREST obtains an additional site in northern CA at no additional cost.

3) Algorithms: A data compression algorithm supplied by Boulder Real Time Technologies was integrated into the Earthworm software, enabling export of ATWC trace data to AEIC. Waveserver software was completed. Datalogger-to-CTS modules are in progress for Quanterra and Reftek units.

4) Future Tasks, exclusive of instrumentation installation

- Install the communications and software for the data loggers at the various sites.
- Install the dedicated 56 Kbit line to PTWC.
- Install a CTS at HVO.
- Install a CTS system at Oregon.
- Install at CTS computer at Golden.
- Perform a needs analysis, design, production, and installation at PTWC.
- Integrate moment tensor computation into software.
- Perform an feasibility analysis of redundant satellite backup system.